

STATISTICS OF COMPOSITAE IN RELATION TO
THE FLORA OF CHINA

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IN JULY 1953 a project for the preparation of a descriptive flora of China was initiated in the Arnold Arboretum under the auspices of the China International Foundation. The first undertaking of the project was the compilation of a comprehensive index to the species of Phanerogams of that country. A staff of five persons spent two and a half years in checking through the extensive botanical literature and in making reference cards of the species of the flowering plants of China. The complete index consists of one hundred and twenty thousand cards, each including name and synonyms of a species, the date and place of publication and the distribution of the taxon as indicated by the citation of various collections, with special emphasis on the type material. This index not only constitutes a comprehensive foundation for the floristic studies and taxonomic researches of the Flora of China Project, but it also reflects a much clearer picture of the vegetation of China than any information we have had before. In a concise and systematic way it tells both the kind of plants which can be found in China and the locations in which each species occurs.

The Compositae constitute the largest family of flowering plants in the world. This statement also holds true for China. The species of Compositae are represented in all parts of the country, from the extensive seashore, in the east, to the alpine tundra of Sinkiang and Tibet, in the west, and from tropical Hainan Island, in the south, to the Mongolian desert, in the north. With the information given on the above-mentioned index cards, I have made an enumeration of the Compositae of China, which gives a total of 219 genera and 3216 species described or recorded from this area. Due to certain nomenclatural changes some of these genera and many of the species have been reduced to synonymy. Meanwhile, because of the treaties made between China and Russia in 1860-64, certain monotypic and oligotypic genera, which were known only from the type localities or from small areas which are no longer within the boundary of China, have to be excluded. Consequently, only 167 genera and 2029 species are here recognized. The basis for choosing the valid binomials has been the recent treatments of various groups by competent taxonomists like Babcock, Chang, Chen, Good, Handel-Mazzetti, Kitamura, Ling, and Stebbins. There is no doubt that the numbers of the recognized taxa will be changed when careful studies of available material are made, the generic limits redefined, and the specific status better determined. Nevertheless, the changes of details probably will not have an appreciable effect on the general picture of the nature, distribution and origin of the vegetation, which an analytic study of the data on the principal elements of the family may reflect.

Up to the present there is no map which shows the phytogeography of China. In recent years students of economic geography as well as of plant geography have tried to prepare phytogeographic maps to illustrate vegetation types in China, but have failed to produce anything which can give a true picture of the vegetation. The difficulty has been that they have not had distributional data of the species that constitute the principal elements of the vegetation. The present paper is an attempt to analyze the distributional data for a large natural group and to utilize it to interpret some of the problems involved in the composition and phylogeny of the vegetation of China. When similar studies on the Gymnospermae, Gramineae, Cyperaceae, Liliaceae, Orchidaceae, Ranunculaceae, Fagaceae, Lauraceae, Rosaceae, Leguminosae and Ericaceae have been made, and with the aid of a few recently monographed families, such as the Magnoliaceae, Theaceae, and Araliaceae, we shall be in a much better position to present a truer phytogeographic map of China.

China is here defined so as to include all the territory covered by W. T. Ting's *Atlas* published in 1934. It has been a general practice among Chinese botanists to include every taxon published from "Manchuria," "Soongoria" and the "Tien-shan Range" in the flora of China. The reason for this practice is that in a standard map of China there is a Manchuria in the northeast (which includes Kirin, Liaoning and Heilungkiang), a Soongaria Basin in western Sinkiang and a Tien-shan in central Sinkiang. But when Maximowicz collected in Manchuria in 1856, and Regel made his Soongaria expedition in 1840 these areas covered much more territory than they do in the present map of China. Due to the 1860 treaty with Russia, the northern and eastern half of Manchuria became a part of the Russian Far East. Likewise, due to the 1864 treaty the western half of Soongaria and western Tien-shan no longer belong to China. For this reason, genera like *Symphyllocarpus* Maxim., from northeastern Manchuria (in the old sense), and *Plagiobasis* Schrenk and *Acanthocephalus* Karelin and Kirilov, from the region of Soongaria beyond the present Chinese border, are excluded from this study.

I. THE TRIBES OF COMPOSITAE

Cassini, in 1812-18, established eleven tribes for the Compositae. Hoffmann in 1889 arranged 806 genera in two subfamilies and thirteen tribes in Engler and Prantl's *Die Natürlichen Pflanzenfamilien* IV. 5: 118. Dalla Torre and Harms in 1905 listed 899 known genera in their *Genera Siphonogamarum*. They placed 877 genera in two subfamilies and thirteen tribes following Hoffman's system and left twenty-two genera as *Genera incertae sedis* at the end. The latest record of the total number of genera of Compositae is found in Lemée's *Dictionnaire Descriptif et Synonymique des Genres de Plantes Phanérogames* 7: 484. 1939, where 1014 genera are recognized. In this work the genera of Compositae are dispersed alphabetically among all the genera of the Phanerogams. It is of little use for

our purpose of making comparative studies of the principal elements of the family. For a concise over-all picture of the Compositae and for systematic comparisons of its tribes and genera, the record in Dalla Torre and Harms still appears to be most useful, especially since many of the larger herbaria are arranged according to this scheme. In modern manuals and handbooks such as those of Fernald, Rehder, Bailey, etc., the names of these tribes appear repeatedly. Since both the system and the names are familiar to students of botany, they are adopted in this discussion.

When *Genera Siphonogamarum* was published, the flora of China was little known to the botanical world. It therefore contains rather inadequate information on the Chinese Compositae. The data on the number of genera in each tribe and the distributional notes of the genera as given in this work are here taken unchanged to give a general view of the tribes of the family. To insure clarity the figures on the tribes of Compositae in China as revealed by our studies are given separately.

1. THE TRIBES OF COMPOSITAE IN GENERAL

Dalla Torre and Harm's information on the sizes, ranges and centers of generic concentration of the tribes of Compositae are summarized in the following graph. Abbreviations commonly used in the literature are adopted for the area column with the following exceptions: Med. Reg. = Mediterranean Region; Aust. = Australia; Pac. Is. = Pacific Islands; and Mad. = Madagascar.

With respect to the number of genera most of the tribes are medium-sized, including forty to sixty-five genera. The large tribes are the Astereae, Inuleae and Heliantheae, each of which has over one hundred genera. The small tribes are the Calenduleae and Arctotieae, the former containing 8 genera and the latter 11. The distributional patterns of the tribes are worthy of notice. The small and medium-sized tribes all have definite areas of generic concentration. Even in the large tribes, although they occupy more extensive areas, the centers of the concentration of their genera are evident.

1. The tribe VERNONIEAE has about 49 genera, 19 of which are from South America, 16 from South Africa, 5 from tropical America, 3 pan-tropic, 2 in Madagascar, 2 in India, and 1 each in Australia and North America. This distributional record indicates that the Vernonieae is essentially a southern tribe with the centers of concentration in South America and South Africa. Only a few of its genera, such as *Elephantopus* and *Vernonia*, extend to the warm region of the north temperate zone.

2. The tribe EUPATORIEAE includes about 51 genera, 16 of which occur in South America, 16 in Mexico and Central America, 9 in North America, 3 in the West Indies. A few genera such as *Eupatorium*, *Mikania*, etc., are represented in all warm regions. Thus, this distributional record indicates that the Eupatorieae are essentially a New World tribe with the generic concentration in tropical America.

TRIBES OF COMPOSITAE & THEIR DISTRIBUTION

TRIBES	NUMBER OF GENERA	AREAS	N. AFR.	MED. REG.	EUR.	ASIA	N. AM.	C. AM.	S. AM.	AUST.	PAC. IS.	TROP. ASIA	MAD.	S. AFR.
1. VERNONIEAE	49													
2. EUPATORIEAE	51													
3. ASTEREAE	107													
4. INULEAE	166													
5. HELIANTHEAE	158													
6. HELENIEAE	59													
7. ANTHEMIDEAE	51													
8. SENECEONEAE	52													
9. CALENDULEAE	8													
10. ARCTOTIEAE	11													
11. CYNAREAE	38													
12. MUTISIEAE	65													
13. CICHORIEAE	62													

FIG. 1. The tribes of Compositae and their distribution in the world.

3. The tribe ASTEREAE includes about 107 genera, 27 of which are from North America, 19 from South America, 11 from Mexico and tropical America, 18 from Africa, 3 from Madagascar, 2 endemic to St. Helena, 2 in the Hawaiian Islands, 3 in Europe, 5 in Australia and New Zealand, and 4 from Asia. In addition, there are many genera that are widely distributed. For example, *Brachycome* is represented in Australia, Tasmania, New Zealand, eastern and tropical Africa; *Lagenophora* occurs in tropical and eastern Asia, New Zealand, Australia and the Pacific Islands; *Myriactis* is found in New Guinea, Java, India and Central Asia; *Podocoma* is represented in tropical America and Australia; *Vittadinia* occurs in New Guinea, Australia, New Zealand, New Caledonia and South America; and both *Aster* and *Erigeron* have large numbers of species in America, Asia, Europe and tropical Africa. This distributional record clearly indicates that the Astereae encompass both widespread and endemic genera. It has several centers of generic concentration, namely Asia, Africa, and North and South America. It is especially well-represented in the New World.

4. The tribe INULEAE is the largest tribe in the Compositae. Of its approximately 166 genera, 84 are from Africa (especially South Africa), 9 from Madagascar, 37 from Australia, 12 from South America, 4 from tropical America. In addition, 12 are common in the Old World tropics and 4 are pantropical genera. This distributional record indicates that the Inuleae is a southern tribe with the centers of generic concentration in South Africa, Australia and, to a lesser degree, tropical Asia. It is rather poorly represented in the northern temperate regions.

5. The tribe HELIANTHEAE includes about 158 genera, 80 of which are from Central America, 30 from the United States occurring chiefly in the southwestern states from Texas to California, 21 from South America, 6 from the Sandwich Islands, 5 from Madagascar and 3 from Africa. In addition, there are 6 pantropic and 4 cosmopolitan genera. This distributional record clearly indicates that the Heliantheae are a New World tribe and, with the exception of the introduced and adventive elements, one which is poorly represented in the Old World.

6. The tribe HELENIEAE includes 59 genera, 36 of which occur in the United States and Mexico, 17 in tropical America and 5 in South America. Tropical Africa has two genera, with *Welwitschiella* being endemic. This distributional record indicates that the tribe Helenieae is essentially a New World group. With the exception of the introduced taxa, it is almost absent in the Old World.

7. The tribe ANTHEMIDEAE includes 51 genera, 18 of which are from South Africa, 10 from the Mediterranean region and the Canary Islands, 4 from Australia, 6 from central and southern Asia, 5 pantropic or cosmopolitan, 1 from North America, 2 from South America and 1 from New Guinea. This record indicates that the Anthemideae are essentially Old World with the generic concentration in South Africa and, to a lesser degree, in the Mediterranean region. The tribe has a few widespread, as well as a few endemic, genera. It is very poorly represented in the New World.

8. The tribe SENECTIONEAE includes 52 genera with 12 occurring in South Africa, 10 in western North America, 4 in Central America, 3 in South America, 2 in the Bourbon Islands, 2 in Australia, 2 in China, 1 endemic to Juan Fernandez Island, and 1 in the European Alps. In addition, three genera are represented in a range covering Africa, Persia and Afghanistan, four in a range covering North Africa, Europe, temperate Asia and North America, two in North Asia, North America, the West Indies and South America, and one, *Senecio*, including 1200 species, occurring throughout the world. At first sight these data do not seem to indicate any significant pattern of distribution for the tribe. But when the Afghanistan-Persia-Africa, the Europe-North Africa-temperate Asia-North America, and the North America-West Indies-South America patterns of distribution are correlated with the continuous chains of high mountains that tie together the continental masses, a very interesting pattern of distribution becomes apparent. Evidently the elements in this tribe are predominantly montane forms. Their distributions correspond with the direction of mountain axes which radiate from western China westward through central Asia to Europe and Africa, northward through northeastern Asia to the Americas and southward through the Malayan Peninsula, the Malayan Archipelago to Australia. The Senecioneae, unlike most other tribes which have obvious centers of generic concentration, are comparatively better represented in eastern Asia, western North America and South Africa.

9. The tribe CALENDULEAE is the smallest one of the family. It has eight genera, five of which occur in the south of Africa and the rest in the

Mediterranean region and western Asia. The Calenduleae are strictly Old World in distribution.

10. The tribe ARCTOTIEAE is the next smallest tribe in the family. It comprises eleven genera, ten of which occur in South Africa and one from Syria to Persia. It is strictly an Old World tribe.

11. The tribe CYNAREAE has 38 genera, 11 of which are confined to western Asia and Persia, 5 to the Mediterranean region, 12 to a wide range extending from southern Europe through Asia to Japan, 5 to Europe to central Asia, 2 common in the temperate and subtropical regions of the northern hemisphere, 1 endemic to China, 1 to India, and 1 to the Juan Fernandez Islands. The tribe Cynareae is essentially an Old World group.

12. The tribe MUTISIEAE has 65 genera, 36 of which are from South America, 4 from the West Indies, 3 from Central America, 8 from tropical and South Africa, 1 endemic to the Hawaiian Islands, 1 from North America, 1 from the European Alps, 2 to the Himalayan region, 2 to China, 2 to Japan and 1 from Afghanistan to Japan. The Mutisieae are predominantly southern with the centers of generic concentration in South America and, to a lesser degree, in South Africa. In the northern hemisphere the tribe is represented by a few endemic genera and one wide-spread genus.

13. The tribe CICHORIEAE includes 64 genera, of which 16 are confined to North America, especially the western United States, 13 to the Mediterranean region, 2 to Europe, 2 to North Africa, 2 to Australia, 5 to China, 1 to South America, 1 to the Society Islands, and 1 to Juan Fernandez Island. In addition, there are many genera with wide ranges. *Sonchus* and *Taraxacum* are cosmopolitan. *Launaea* ranges from South Africa to central Asia and temperate Europe. There are six other genera occurring from Europe to central Asia, six from Europe to temperate Asia and North America and four in western and central Asia. This distributional record seems to indicate that the Cichorieae are essentially an Old World group with an African-Eurasian-American distribution. There are nine genera, *Sonchus*, *Crepis*, *Lapsana*, *Hypochoeris*, *Mulgedium*, *Lactuca*, *Taraxacum*, *Prenanthes* and *Hieracium*, which occur on all these continents. It seems that along this African-Eurasian-American distribution-belt variation occurred particularly in the Mediterranean region, in China, and in the western United States.

2. THE TRIBES OF COMPOSITAE IN CHINA

All the 13 tribes of Compositae are represented in the flora of China by either native or introduced species. Their size, as represented by the recognized genera, their effect in the appearance of the general flora and their prominence in the natural flora, as illustrated by the species/genus ratio, may be summarized in the following table.

TABLE I. The Tribes of Compositae in China²

TRIBES	NO. OF GENERA	NO. OF SPECIES	SPECIES/GENUS RATIO	LARGE GENERA (10 OR MORE SPECIES)	SMALL GENERA (9 OR FEWER SPECIES)	NO. OF ENDEMIC GENERA
Vernonieae	6	40	7-	1	5	0
Eupatorieae	4	24	6	1	3	0
Astereae	22	203	9+	3	19	9
Inuleae	19	229	12+	6	13	2
Heliantheae	24	46	2-	0	24	1
Helenieae	3	5	2-	0	3	0
Anthemideae	17	271	16-	3	14	4
Senecioneae	17	358	23-	5	12	7
Calenduleae	1	2	2	0	1	0
Arctotieae	1	1	1	0	1	0
Cynareae	23	439	19+	6	17	7
Mutisieae	6	71	12-	3	3	2
Cichorieae	24	340	15	10	14	3
TOTAL	167	2029	12+ (average)	38	129	34

² No distinction is made here between native and introduced species. See text.

As indicated by the number of recognized genera the Heliantheae and the Cichorieae are the largest tribes of Compositae in China. However, their positions in the flora of China are very different. In the Heliantheae, with the exception of *Sheareria*, all the genera have been introduced through the intentional or accidental activities of man. Naturally, these introduced genera are small ones in the flora of China and their species/genus ratio for the tribe in China is less than two. Over two-thirds of these genera contain only one species each, and the others have two to six species. However, to a casual traveler who visits only the large cities or coastal areas of the country the members of this tribe may appear to be the most prominent feature in the general flora of the region. This is because the most commonly cultivated Compositae in the gardens of Chinese metropolises, (species of *Zinnia*, *Helianthus*, *Coreopsis*, *Dahlia* and *Cosmos*) are Heliantheae. Likewise, the most widespread weeds of the area, common in parks, gardens and school-yards (species of *Xanthium*, *Siegesbeckia*, *Eclipta*, *Bidens*, *Galinsoga* and *Wedelia*) also belong to this tribe. With the exception of these cultivated and weedy species, the other members of this tribe have a very limited distribution, being found chiefly in the warmer regions of the country. They occupy a very minor position as constituents of the natural vegetation in China.

Unlike the Heliantheae, the tribe Cichorieae is large both in the number and size of its included genera. The species/genus ratio for this tribe in China is fifteen. As illustrated in Table II, *Lactuca*, *Taraxacum*, *Crepis* and *Youngia* are the large genera in this tribe. Each of the first two genera

has fifty-seven species in China, and each of the other two genera has over thirty species. Moreover, the Cichorieae include the largest number of large genera among all the tribes of the Chinese Compositae. Many of these large genera, such as *Taraxacum*, *Lactuca*, *Youngia* and *Ixeris* contain relatively widespread species, some of which have become more or less weedy. The region on the borders of Yunnan, Szechuan, and Sikang (the Meridional Ranges) seems to constitute the area of the species concentration of many genera of this tribe. Maps 22 and 23 indicate that a large number of the species in the genera *Lactuca*, *Crepis* and *Youngia* occur in this region. According to Stebbins, this area is also the point of origin and the center of distribution of three endemic genera, *Dubyaea*, *Soroseris* and *Faberia*. He also maintains that *Dubyaea* is the most primitive genus of the tribe. Because of its large number of genera, its rather high species/genus ratio and its unique endemism, the Cichorieae contribute important elements to the composition of the natural vegetation of the country.

The next largest tribes of Compositae in China are the Astereae, Cynareae, Inuleae, Anthemideae and Senecioneae. Like Cichorieae these tribes are comparatively large for the number of their included genera. Senecioneae and Cynareae both have high species/genus ratios, while Astereae, Senecioneae and Cynareae contain the largest number of endemic genera. They are important elements in the natural vegetation of the country. The most striking feature lies with the Senecioneae. This tribe has the highest species/genus ratio among all the tribes of Compositae in China, and this high ratio is due to the large number of species of only four genera, namely, *Senecio* 160, *Ligularia* 105, *Cacalia* 60, and *Cremanthodium* 47. The center of concentration of species of these closely related genera is the Meridional Ranges. This region is not only the home of many endemic species of these large genera, it is also the site of many monotypic and oligotypic endemic genera of this and related tribes. Good's statement (1929, p. 313) concerning *Cremanthodium* in this region, "the present point of highest species concentration happens also to be the generic point of origin," could be applied to many genera of the Astereae, Cynareae, Inuleae, Anthemideae and Senecioneae, including the genus *Senecio*.

The tribe Mutiseae is a relatively small one in China. Nevertheless, the tribe is fairly well represented in the natural vegetation of the country. With the exception of *Gerbera* which has a South Africa-Madagascar-tropical Asia distribution with the Chinese species marking the northern limit of its range, all the other genera of Mutiseae in China are essentially Chinese. Three of them (*Leucomeris*, *Myriopholis* and *Nouellia*) are genera endemic to China. The other two have ranges extending either from India to Japan (*Ainsliaea*) or from Afghanistan to Japan (*Pertya*) with China being the center of their distribution. Forty-seven out of a total of fifty species of *Ainsliaea* occur in China, and ten of the twelve species of *Pertya* are Chinese.

Vernonieae and Eupatorieae are poorly represented in China and those genera which do occur are essentially widespread tropical taxa. As weedy species they may produce quite a prominent effect on the general flora in

the warmer regions of China. With the exception of *Eupatorium* their distributions are very limited.

The Helenieae, Calenduleae and Arctotieae are represented in China only as cultigens.

II. THE GENERA OF COMPOSITAE IN CHINA

Two hundred and nineteen genera of Compositae have been recorded from China. Fifty-two of them belong to the doubtful and excluded category. The sizes and distributions of these genera within China and a comparison with the figures for the world are summarized in the following table. In this enumeration the genera are presented in the sequence of Dalla Torre and Harms. The numerals in the parentheses immediately following the names are those assigned by those authors. The names which do not have such numerals in parentheses are either invalid epithets or valid genera published after 1905. Most of the names in the latter group represent genera peculiar to the flora in China. The total number of species in each genus and the general area of distribution are chiefly adopted from Dalla Torre and Harms. A few of them are summarized from the *Index Kewensis*.

In presenting the distribution of the genera within China the following abbreviations are used. A = Anhwei, Cha = Chahar, Che = Chekiang, Chi = Chinghai, F = Fukien, H = Hainan, He = Heilungkiang, Hn = Honan, Hp = Hopei, Hun = Hunan, Hup = Hupei, J = Jehol, Kan = Kansu, Ki = Kiangsi, Kir = Kirin, Ks = Kwangsi, Kt = Kwangtung, Ku = Kiangsu, Kwe = Kweichow, L = Liaoning, M = Mongolia, N = Ninghsia, Sa = Shansi, Se = Shensi, Si = Sikang, Sin = Sinkiang, St = Shantung, Sy = Suiyuan, Sze = Szechuan, T = Taiwan, Tib = Tibet and Y = Yunnan.

In the remarks column the word "endemic" refers to the genus or species described from or limited to China.

Genera known only in cultivation or as adventives are in large and small capitals. Synonyms and other excluded names are in italics.

TABLE II. An Enumeration of the Genera of Compositae in China

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
Vernonieae					
ETHULIA (6)	3	Trop. As, Afr, Mad.	1	1	T; adventive.
Vernonia (23)	450	Am, Afr, Mad, trop. As.	55	34	See map 1, 20 spp. endemic.
Camchaya	3	Indo-China, Siam	1	1	Y.
STOKESIA (35)	1	N. Am.	1	1	Cultivated.
ELEPHANTOPUS (47)	16	Pantrop; Am, espec.	5	2	T, Kt, H, Sze; adventive.
PSEUDOELEPHANTOPUS	1	Pantrop.	1	1	T; adventive.

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TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED	DISTRIBUTION & REMARKS	
Eupatorieae					
<i>Adenostemma</i> (57)	6	Pantrop.	4	2	T, Kt, H, Che, Hup, Kwe, Y, Sze, Hp.
<i>AGERATUM</i> (67)	30	Trop. N. Am.	3	2	T, F, Kt, H, Che, Y, Sze; cultivated, naturalized.
<i>Eupatorium</i> (88)	400	Am, Eur, As, Afr.	28	17	See map 2.
<i>Mikania</i> (90)	150	Pantrop; Am, espec.	4	3	Kt, H, T.
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Astereae					
<i>Solidago</i> (121)	80	N. Am.	6	5	Kt, Hun, Kwe, Y, T, Kir, Ku, Mong, Sin.
<i>Pteronia</i> (134)	50	S. Afr.	1	0	Chinese sp. transferred to <i>Vernonia</i>
<i>Dichrocephala</i> (138)	5	Afr, trop. As.	8	3	T, F, Kt, H, Y, Kwe, Sze, Tib.
<i>Cyathocline</i> (139)	2	India to s. China.	1	1	Kt, Kwe, Y.
<i>Grangea</i> (137)	3	Trop. As, Afr.	3	2	T, Kt, H.
<i>Lagenophora</i> (146)	12	Trop. As, to Austr.	3	1	T, Kt.
<i>Rhynchospermum</i> (147)	1	India, Malaya.	2	1	T, Y; monotypic.
<i>Myriactis</i> (148)	10	E. Himal. reg.	9	5	Y, Sze, T, Kwe; natural distribution.
<i>BELLIS</i> (151)	10	Medit. reg.	1	1	Cultivated.
<i>CALOTIS</i> (157)	16	Austr.	1	1	H; adventive.
<i>Asteromoea</i> (165)	11	E. Asia.	11	10	Kt, Hun, Y, Sze, Sa, Se, St, Hp, Ku, F, Che, Ki, Hup.
<i>Kalimeris</i>	7	E. Asia.	7	0	Transferred to <i>Asteromoea</i> .
<i>Martinia</i>	1	E. Asia.	1	0	Transferred to <i>Asteromoea</i> .
<i>Callistephus</i> (170)	2	E. Asia.	2	1	Cha, Tib, Hp, Sa, Kir, He; endemic.
<i>Callistemma</i>	2	E. Asia.	2	0	= <i>Callistephus</i> .
<i>Boltonia</i> (164)	5	N. Am.	6	0	Misidentified; Chinese material = <i>Asteromoea</i> .
<i>Heteropappus</i> (168)	6	E. Asia.	10	5	St, He, M, Che, T, Kir, Kw.
<i>Arctogeron</i>	1	Mongolia.	1	1	M; endemic.
<i>Wardaster</i>	1	W. China.	1	1	Si; endemic.
<i>Aster</i> (172)	200	Am, As, Eur, S. Afr.	204	137	See map 3.
<i>Calimeris</i>			9	0	= <i>Aster</i> .
<i>Diplopappus</i>			4	0	= <i>Aster</i> .
<i>Rhinactina</i>			2	0	= <i>Aster</i> .
<i>Turczaninovia</i>			1	0	= <i>Aster</i> .
<i>Asterothamnus</i>	7	NW. China.	7	7	
<i>Pseudolinosyris</i>	2	Centr. Asia.	2	0	Not in Chinese territory now.

TABLE II. (*Continued*)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
<i>Galatella</i>	25	Centr. Asia.	17	7	Si, M.
<i>Brachyactis</i>	13	Centr. Asia.	3	3	Hp, Se, Kan, Sin, J, Sy, Si, Tib.
<i>Heteroplexis</i>	1	S. China.	1	1	Ks; endemic.
<i>Erigeron</i> (173)	150	Am, As, Eur, Austr.	40	25	See map 4.
<i>Microglossa</i> (193)	10	Trop. As, Afr, Mad.	3	3	Kwe, Y, Sze
<i>Vierhapperia</i>	1	Monotypic.	1	1	Y; endemic.
<i>Conyza</i> (198)	50	Pantrop.	36	7	T, F, Y, Sze, Che, Kwe; indicates ex- tent of tropical ele- ments.
<i>Thespis</i> (199)	1	Himal. reg.	1	1	Y.
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Inuleae					
<i>Cava</i>	1	W. China.	1	1	Tib, Sze; mono- typic.
<i>Blumea</i> (211)	60	Trop. Afr, As, Austr.	59	30	See map 5; 10 en- demics.
<i>Bileveillea</i>			3	0	= <i>Blumea</i> .
<i>Leveillea</i>			3	0	= <i>Blumea</i> .
<i>Blumeopsis</i>	2	Indo-China.	1	1	H, Y.
<i>Laggera</i> (212)	10	Afr, As, Austr.	6	2	T, Y, Sze, Hup.
<i>Pluchea</i> (213)	30	Pantrop.	7	3	T, Kt, H, Sze.
<i>Epaltes</i> (225)	10	Pantrop.	2	2	Kt, H.
<i>Poilania</i>	1	Indo-China.	1	0	= <i>Epaltes</i> .
<i>Sphaeranthus</i> (227)	17	Afr, As, Austr.	8	3	T, Kt, H, Y.
<i>Pterocaulon</i> (229)	12	Am, Austr, Maurit, Mad, India	1	1	H.
<i>Evax</i> (238)	15	Med. reg, As, N. Am.	1	1	Sin.
<i>Filago</i> (241)	12	Eur, N. Afr, As, Am.	3	3	Tib, Sin.
<i>Leontopodium</i> (254)	ca. 70	Eur, As, Am, S. Am, Japan.	63	57	See map 6.
<i>Anaphalis</i> (255)	70	Eur, As, N. Am.	67	51	See map 7.
<i>Antennaria</i> (250)	15	Eur, As, Austr, Am.	5	2	Sin, M, Sze.
<i>Phagnalon</i> (260)	20	Canary Is, Med. reg, Abyss, Himal. reg.	1	0	Not in Chinese ter- ritory now.
<i>Gnaphalium</i> (264)	120	Pantrop.	52	20	See map 8.
HELICHRYSUM (278)	300	Eur, Afr, Austr.	2	2	1 cult, 1 Sin; in- troduced
<i>Tugarinovi</i>	1	N. China.	1	1	Sy; endemic.
<i>Inula</i> (333)	90	Eur, As, Afr.	42	28	See map 9.
<i>Duhaldea</i>	1	S. China.	1	0	= <i>Inula</i> .
<i>Vicoa</i>	16	Centr. As. to trop. Afr.	1	1	Y.
<i>Pulicaria</i> (350)	30	Med. reg, Eur, As, S. Afr.	4	4	Sin, Tib, Kwe.
<i>Carpesium</i> (353)	30	Eur, As.	30	18	T, Kt, H, Che, Ku, Hun, Hup, Y, Sze, Kwe, Sa, Kan, Si, Hp, Se, St, Tib, Kir.
<i>Adenocaulon</i> (354)	4	Himal. Reg, Am, Chile.	4	2	St, Kir, Sa, Cha.

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
<i>Bupthalmum</i> (364)	7	Eur, W. As.	1	0	Chinese material transferred to <i>Chrysanthemum</i> .
<i>Anisopappus</i> (368)	3	Trop. Afr. * * * * *	2	1	Kt, H.
Heliantheae					
<i>Sheareria</i> (389)	2	Centr. China.	2	2	Che, Kt, Ki, Hup, Hun; endemic.
<i>AMBROSIA</i> (417)	15	Am, Med. reg, Afr.	1	1	Introduced.
<i>Xanthium</i> (419)	15?	Cosmopolitan.	7	2	Widespread.
<i>ACANTHOSPERMUM</i> (401)	3	Trop. Am.	1	1	Y; introduced.
<i>PARTHENIUM</i> (409)	9	N. & Centr. Am.	1	1	Kt; introduced.
<i>ZINNIA</i> (424)	12	N. & Centr. Am.	3	3	Cultivated.
<i>SANVITALIA</i> (427)	8	N. Am.	1	1	Kt; introduced.
<i>HELIOPSIS</i> (428)	7	N. & Centr. Am.	1	1	Cultivated.
<i>Siegesbeckia</i> (431)	10	Pantrop.	8	4	2 widespread, 2 ± localized.
<i>ENHYDRA</i> (435)	9	Centr. & S. Am, Austr.	1	1	H; introduced.
<i>Eclipta</i> (437)	4	S. Am, Austr; 1 sp. cosmopolitan.	1	1	Widespread; troublesome weed.
<i>RUDBECKIA</i> (449)	30	N. Am, Mex.	1	1	Cultivated.
<i>Blainvillea</i> (461)	9	Pantrop.	1	1	H.
<i>Wedelia</i> (463)	60	Pantrop.	6	5	T, Kt, Y, H, Sze.
<i>Wollastonia</i>			3	0	= <i>Wedelia</i>
<i>TITHONIA</i> (467)	10	Centr. Am.	1	1	Cultivated.
<i>HELIANTHUS</i> (471)	60	N. & Centr. Am.	6	4	Cultivated.
<i>Spilanthes</i> (478)	30	Am; 2 pantrop.	3	2	T, H, Y; 1 endemic.
<i>SYNEDRELLA</i> (495)	2	Trop. Am.	1	1	T, H, Kt
<i>COREOPSIS</i> (498)	70	Am, trop. Afr, Hawaiian Is.	7	3	Cultivated.
<i>DAHLIA</i> (499)	9	Mexico.	1	1	Cultivated.
<i>GLOSSOGYNE</i> (505)	5	Trop. As, Austr.	2	1	T, F, Kt, H; introduced.
<i>Bidens</i> (508)	90	Cosmopolitan, espec. Am.	17	6	Widespread; many vars.
<i>COSMOS</i> (509)	20	Am.	1	1	Cultivated.
<i>GALINSOGA</i> (517)	4	Am.	1	1	Sze, Y, Kt; newly introduced weed.
<i>TRIDAX</i> (516)	20	Centr. Am.	1	1	T; newly introduced.
		* * * * *			
Helenieae					
<i>HELENIUM</i> (576)	30	Am.	1	1	Cultivated.
<i>GALLARDIA</i> (577)	12	Am.	2	2	Cultivated.
<i>TAGETES</i> (582)	20	Am.	2	2	Cultivated.
		* * * * *			
Anthemideae					
<i>ANTHEMIS</i> (601)	100	Eur, Med. reg, Abyss, As, Am.	6	4	North China.

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
<i>Handelia</i>	1	Monotypic.	1	0	Not in Chinese territory.
<i>Achillea</i> (603)	100	N. hemisphere.	14	10	See map 10.
<i>Ptarmica</i>			6	0	= <i>Achillea</i> .
<i>Matricaria</i> (610)	50	Med. reg, S. Afr, Eur, As.	14	4	He, St, Hp, L.
<i>Allardia</i> (614)	2	Centr. As.	2	2	Tib, Sin; endemic.
<i>Waldheimia</i>	2		2	0	= <i>Allardia</i> .
<i>Formania</i>	1	China.	1	1	Y; endemic.
<i>Filifolium</i>	1	N. China.	1	1	Hp, to He; endemic.
<i>Brachanthemum</i>	5	Centr. As.	5	5	Sin, M, Kan; arid regions.
<i>Chrysanthemum</i> (612)	200	Eur, As, Afr, Canary Is.	96	73	See map 11.
<i>Pyrethrum</i> (612b)	50?	Centr. & W. As.	18	5	Sin.
<i>Tanacetum</i>	130	Centr. & W. As.	44	0	= <i>Chrysanthemum</i>
<i>Cancrinia</i> (633)	9	Centr. As.	4	3	Sin, Tib, Y, Kan.
<i>Cotula</i> (622)	50	Temp. & subtrop. reg.	4	2	T, Kt, Hup, Sze.
SOLIVA (623)	6	S. Am, Austr, N. Am.	1	1	T; adventive.
<i>Centipeda</i> (624)	5	Austr. trop. As. Mad, Chile.	1	1	T, Kt, H, Che, Ku, Hun, Sze, Hp, St; widespread weed.
<i>Myriogyne</i>	1		1	0	= <i>Centipeda</i> .
SPHAEROMORPHAEA	1	India, Siam.	1	1	T; adventive.
<i>Crossostephium</i> (630)	1	Luzon, E. As.	1	1	T, Kt; monotypic.
<i>Stilpnolepis</i>	1	Monotypic.	1	1	Sy; endemic.
<i>Artemisia</i> (629)	200	Cosmopolitan.	186	156	See map 12.
* * * * *					
Senecioneae					
<i>Stereosanthus</i> (650)	4	China.	5	4	Y, Sze, Si; endemic.
<i>Nannoglottis</i> (649)	2	China.	2	2	Kan, Y; endemic.
<i>Tussilago</i> (651)	1	N. Afr, Eur, As, Am.	5	1	Y, Sze, Hp, Sy, Se, Kan, Sin.
<i>Petasites</i> (652)	14	N. hemisphere.	10	9	T, Ku, Hup, Sze, St, M, Y, Se, Si.
<i>Nardosmia</i>	19	N. hemisphere.	3	0	= <i>Petasites</i> .
<i>Erechtites</i> (660)	15	Trop. Am, Austr, N. Zeal.	2	2	T, H, Y, Ks, Kt.
<i>Doronicum</i> (671)	25	N. hemisphere.	6	3	Y, Sze, Si, Se, Kan, N, M, Sin, Tibet.
<i>Gynura</i> (676)	25	Trop. As, Austr, Afr.	26	16	T, H, Sze, Si, Kt, Y, Kwe, Hup, Che, Se, A.
<i>Emilia</i> (682a)	40	Trop. Afr, Mad, trop. As.	10	3	Kt, Che, westward to Y.
<i>Cineraria</i> (677)	25	S. Afr, Mad.	9	1	Largely transferred to <i>Senecio</i> or <i>Ligularia</i> .

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA			
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS	
<i>Cacalia</i> (680)	70	As, N. & Centr. Am.	67	60	Widespread; not in F, Kt, H; endemic sp.	
<i>Parasenecio</i>	1		1	0	= <i>Cacalia</i> .	
<i>Syneilesis</i>	4	China.	4	4	Kir, He, Che, A, T; see <i>Senecio</i> .	
<i>Chlamydites</i>	1	Monotypic.	1	1	Tib; endemic.	
<i>Senecio</i> (682)	1200	Cosmopolitan.	363	160	See map 14.	
<i>ARNICA</i> (667)	20	N. Am, Eur.	3	1	Cultivated.	
<i>Ligularia</i> (683)	150	Eur, As.	125	105	T, Y, Sze, Si, Kan, Kwe, Sa, M, Sin, Tib, L, Kir, Ki, St, Hn, Che, Hun, Hup, Hp, Chi, He, Sy, Cha, J.	
<i>Farfugium</i>	3	E. As.	4	1	T, Kt, Che, Hup.	
<i>Senecillis</i>	70	Centr. & E. As.	45	0	= <i>Ligularia</i> .	
<i>Cremanthodium</i> (684)	60	Himal. reg.	57	47	See map 15.	
<i>Werneria</i> (686)	30	S. Am, trop. Afr.	2	0	Transferred to <i>Cremanthodium</i> .	
		* * * * *				
Calenduleae						
<i>CALENDULA</i> (694)	15	Med. reg. to Persia.	2	2	Cultivated.	
		* * * * *				
Arctotieae						
<i>ARCTOTIS</i> (703)	60	S. Afr.	2	1	Cultivated, recent introduction.	
<i>Gorteria</i> (704)	4	S. Afr.	1	0	Misidentified.	
		* * * * *				
Cynareae						
<i>Echinops</i> (713)	60	E. As, S. Eur, Med. reg., S. Afr.	15	11	Lower Yellow River.	
<i>Xeranthemum</i> (716)	6	Med. reg., W. As.	2	0	= <i>Helichrysum</i> or <i>Blumea</i> .	
<i>Atractylis</i> (721)	15	Canary Is, Med. reg., N. Afr.	9	8	North of Yangtze, lower Yellow River.	
<i>Atractylodes</i>			8	0	= <i>Atractylis</i> .	
<i>Giraldia</i>			1	0	= <i>Atractylis</i> .	
<i>Arctium</i> (723)	6	Eur, As, N. Am.	3	2	N. China to Sin.	
<i>Cousinia</i> (724)	250	Centr. As.	2	2	Tib, Sin; arid regions.	
<i>Xanthopappus</i> (726)	2	NW. China.	2	2	Chi, Si, Kan; endemic.	
<i>Takeikadzuchia</i>	1	N. China.	1	1	Cha; endemic.	
<i>Olgaea</i>	11	N. China.	11	9	M, Kan, N, Sa, Sin, Hp; endemic.	
<i>Alfredia</i>	11	Centr. As.	3	0	Not in Chinese territory.	
<i>Carduus</i> (732)	100	Eur, Afr, As.	19	11	See map 16.	
<i>ONOPORDON</i> (738)	20	Afr, Eur, W. As.	1	1	Sink.	

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
<i>Cnicus</i> (750)	1	Eur, As.	32	0	Transferred to <i>Cirsium</i> .
<i>Cirsium</i> (733)	150	N. Afr, Eur, As, N. & Centr. Am.	70	59	Widespread.
<i>Cephalonoplos</i>	4	E. As.	3	3	St, Sa, Se, Kir, He, L, J, Cha, Sy, Tib; a segregate from <i>Cirsium</i> .
CYNARA (734)	12	Med. reg.	2	2	Cultivated; recent introduction.
<i>Hemistepta</i>	1	E. As.	1	1	T, Kt, Ku, Y, Sze, St, Hn, Hp, Se; monotypic, a com- mon weed.
<i>Saussurea</i> (728)	125	N. hemisphere, Austr.	338	270	See map 17; larg- est genus in China.
<i>Bolocephalus</i>	1	Monotypic.	1	1	Si; endemic.
<i>Vladimiria</i>	1	Monotypic.	1	1	Y; endemic.
<i>Mazzettia</i>	1		1	0	= <i>Vladimiria</i> .
<i>Jurinea</i> (730)	50	Centr. & S. Eur, N. Afr, W. & Centr. As.	18	18	Y, Sze, Tib, Sin.
<i>Tricholepis</i> (744)	12	Himal. reg.	1	1	Y, Tib.
<i>Synurus</i>	8	Temp. As.	4	3	Che, Ki, Hup, St, Hp, Se, Kir, He.
SILYBUM (735)	2	Canary Is, Med. reg. to Persia	1	1	Introduced.
<i>Serratula</i> (745)	40	Eur. to Japan	43	19	See map 18.
<i>Leuzea</i>			1	0	Transferred to <i>Rhaponticum</i> .
<i>Rhaponticum</i>			1	1	Hp, Se, Kir, He, Cha.
<i>Centaurea</i> (747)	500	Med. reg., Eur, As, N. & S. Am, Austr.	8	7	Sin, Ku, Hn, to M, Tib, Kan.
CARTHAMUS (748)	20	Med. reg. to Centr. As.	1	1	Cultivated in W. China.
* * * * *					
Mutisieae					
<i>Leucomeris</i> (756)	2	E. Himal. Reg.	1	1	Y.
<i>Pertya</i> (775)	12	Afghan. to Japan	12	10	Y, S, Kan, to Che, Kt.
<i>Myriopsis</i> (782)	2	China.	3	2	Hopei to Kansu, en- demic.
<i>Ainsliaea</i> (783)	50	India to Japan.	58	47	Y, Sze, due east to Taiwan.
<i>Nouelia</i> (791)	1	Monotypic.	1	1	Y, Sze; endemic.
<i>Gerbera</i> (798)	40	S. Afr, Mad, trop. As, Tasmania.	18	10	Kt, Hun, Hup, Y, Kwe, Sze, St, Hp, Sa, Se, Kan, M, St, N, Kir, Cha; 2 widespread, the others endemic.

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		DISTRIBUTION & REMARKS
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		
<i>Leibnitzia</i>	5	E. As.	4	4	T, Kir, He, J, Y, Tib; segregate from <i>Gerbera</i> .
<i>Anandria</i>	6	E. As.	2	0	Misidentified; = <i>Gerbera</i> .
		* * * * *			
Cichorieae					
CICHORIUM (823)	8	Med. reg. to temp. As.	2	2	Ku, St, Hp, Sa, Se, Sin; cultivated or weeds.
<i>Lapsana</i> (825)	9	Eur, As, Am.	3	3	Kt, Che, Ku, Ki, Hup, Sze, Se; 1 widespread along Yangtze, 2 localized, coastal.
<i>Koelpinia</i> (832)	3	Med. reg., Afr, Centr. As.	1	1	Sink.
<i>Acanthocephalus</i>	2	Centr. As.	1	0	Not in Chinese territory now.
<i>Rhagadiolus</i>	8	Centr. As.	1	0	Not in Chinese territory now.
<i>Hypochoeris</i> (842)	50	Eur, Med. reg, N. As, N. Am.	4	3	Kir, He, Jehol, St, Hp, L.
<i>Heteracea</i>	1	Centr. As.	1	0	Not in China.
<i>Tragopogon</i> (849)	40	Eur, Med. reg, W. & centr. As.	10	10	See map 20; Centr. Asian element.
<i>Scorzonera</i> (851)	100	Eur, Med. reg, W. & Centr. As.	20	18	See map 20.
<i>Picris</i> (845)	40	Eur, Med. Reg, Abyss, temp. As.	9	8	Kir, He, Y, Sze, St, Sin, Kt, Kan; 1 widespread, 2 endemic.
<i>Lagoseris</i>	32	centr. & W. As.	1	0	Not in China.
<i>Taraxacum</i> (862)	1200?	Cosmopolitan	67	57	See map 21.
<i>Leontodon</i>	123	Eur, centr. & W. As.	8	0	Chinese spp. = <i>Taraxacum</i>
<i>Chondrilla</i> (860)	18	Eur, As.	3	3	Sin, Kan.
<i>Sonchus</i> (865)	45	Cosmopolitan	19	10	Widespread; weedy.
<i>Launaea</i> (863)	30	Med. Reg, S. Afr, trop. As, E. Indies	5	4	H, Y, Sze.
<i>Lactuca</i> (866)	150	Cosmopolitan.	112	81	See map 22.
<i>Mycelis</i>	5	E. As.	2	0	= <i>Lactuca</i> .
<i>Cicerbita</i>	60	Centr. As.	7	7	Y, Si, Sze.
<i>Mulgedium</i>	7	Centr. As.	2	0	= <i>Lactuca</i> .
<i>Sorosaris</i>	9	W. China.	9	9	Y, Sze, Kan, Chi, Sin; endemic.
<i>Prenanthes</i> (876)	30	Eur, Med. reg, Canary Isl, As. Am.	25	19	Y, Sze, Si, Tib, Hup, Hun, Kan, Se, Sa, St, Hp, Cha, Kir.

TABLE II. (Continued)

TRIBES & GENERA	WORLD FIGURES		SPECIES IN CHINA		
	TOTAL NO. SPP.	GENERAL DISTRIBUTION	RECORDED & RECOGNIZED		DISTRIBUTION & REMARKS
<i>Faberia</i> (872)	6	W. China.	7	6	Y, Sze, Kwe; endemic.
<i>Crepis</i> (875)	200	N. hemisphere.	83	31	See map 23.
<i>Barkhausia</i>			4	0	= <i>Crepis</i> .
<i>Geblera</i>			2	0	= <i>Youngia</i> .
<i>Youngia</i>	35	Himal. reg. to Japan.	39	30	See map 22.
<i>Ixeris</i>	20	Himal. reg. to Japan.	26	14	See map 23; common weed.
<i>Crepidiastrum</i>	7	E. As.	4	3	T, Che.
<i>Dubyaea</i>	12	E. Himal. reg.	12	7	Y, Sze.
<i>Holeleion</i>	3	Japan.	1	1	Ku.
<i>Hieracium</i> (877)	400	Eur, Am, Afr, As.	17	14	Ku, Ki, T, Sze, Kwe, Sin, Hp, M, Se, St, Kir, He, Cha, Sy; mostly isolated spp. known from one collection.
<i>Crepidiastrixeris</i>	3	Japan, E. China.	1	1	Che; a hybrid genus.

With the exclusion of the doubtful and invalid genera there are only 167 genera of Compositae in China. Most of these genera are small. Fifty-seven of them have only one species each, and 40 others have 2 or 3 species each. The largest of all is *Saussurea* with 279 species. The next in size are *Senecio* with 160 species, *Artemisia* with 156, *Aster* with 137 and *Ligularia* with 105 species. Some botanists, such as Franchet, interpret *Senecio* in a broader sense and place *Ligularia*, *Cacalia* and *Cremanthodium* in it as sections. In this broader sense, *Senecio* would have 372 species in China and thus become the largest genus of Compositae in that country, as it is also the largest genus of the Compositae in the world.

1. THE LARGE GENERA AND THEIR DISTRIBUTIONS

Only 38 genera of the Chinese Compositae contain ten or more species. For convenience of discussion, these are called the "large genera." They are scattered in the Vernoniaceae, Eupatorieae, Astereae, Inuleae, Anthemideae, Senecioneae, Cynareae, Mutisieae and Cichorieae (TABLE I). By plotting the occurrence of all the species of a large genus on an outline map of China, striking distributional patterns of these large genera are revealed. In these maps circles represent species occurring only in one province and the dots denote species recorded from two or more provinces. The combined number of circles and dots within the confines of a province gives the total number of species of the genus under discussion in that province. Thus a distribution map for a given genus tells both its range and its area of concentration of species. In a few cases two relatively

small genera are plotted on one map. Triangles are used to represent the species of the second genus, with the white ones indicating local endemics and the solid ones species of wider range.

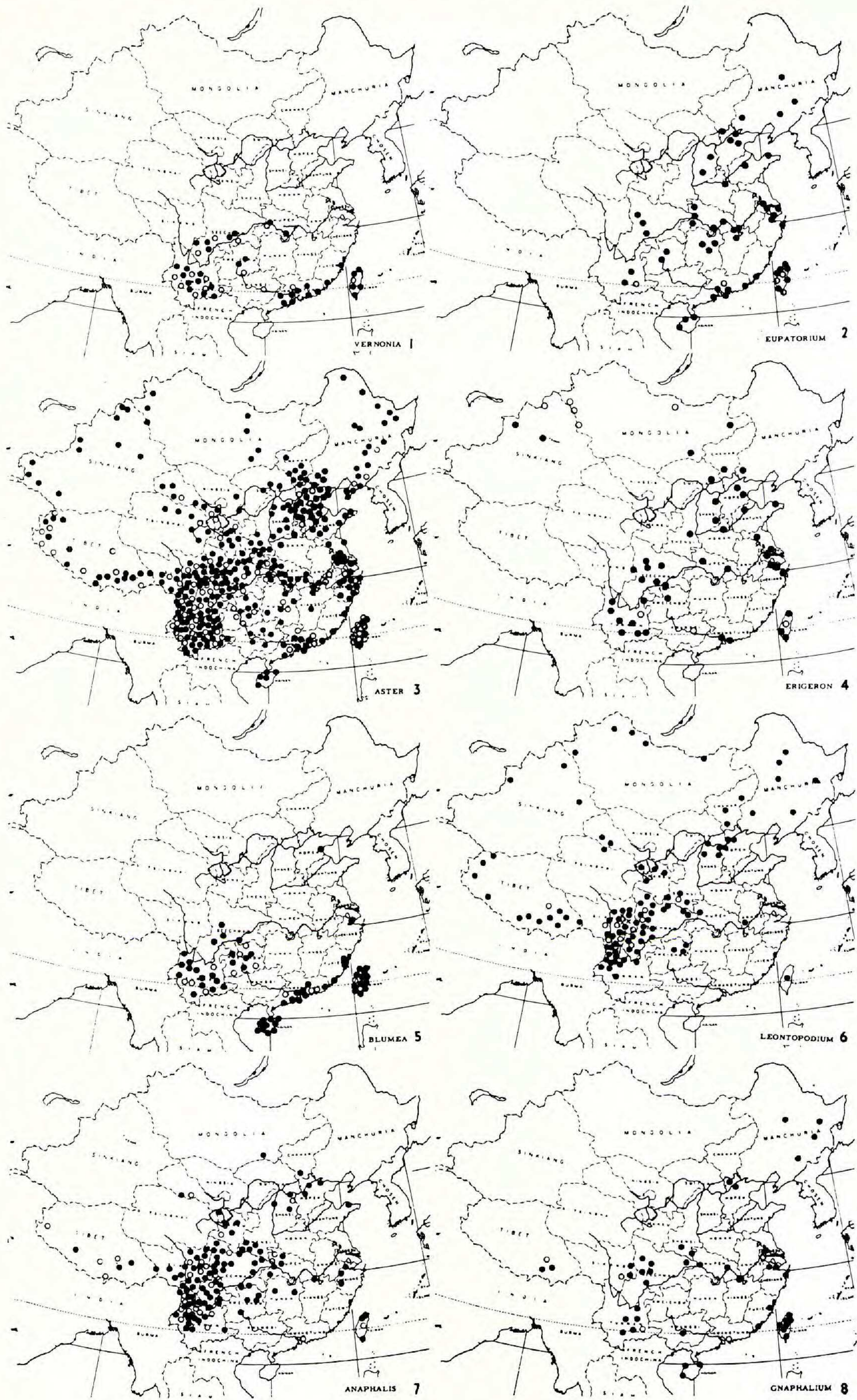
Vernonia is a genus of wide range with species in the Americas, Africa, Madagascar, and tropical Asia. In China there are thirty-four species, with a concentration in Taiwan, Kwangtung, Yunnan and Szechuan. Ten of these thirty-four have an Indo-Malaysian range, two of them extend to Java, and twenty of them are endemic to China. Six of these endemics occur in Yunnan (MAP 1). In general *Vernonia* is a southern genus and its range does not reach north of the Yangtze River.

Eupatorium is another widespread genus with many species, especially in Central and South America, Africa, Europe and Asia. In China there are seventeen species, and most of them are evenly distributed from Hainan to Heilungkiang (MAP 2). Endemism is relatively low. Taiwan seems to have the largest species concentration. It is interesting to note that this genus is absent in the northern and western half of the country.

Aster is the third largest genus of Compositae in China. It contains 137 species occurring in every province of the country. The centers of species concentration are Yunnan (51 species), Szechuan (48 species), Sikang (30 species), Kansu (20 species) and Hopei (20 species). Taiwan has 15 species. Considering the small size of the island, the genus is very well represented there. This genus has many widespread species in China. For example, *A. ageratoides* and its varieties occur in twenty-three provinces and *A. altaiacus* and its varieties occur in nineteen provinces. Many species share the Yunnan-Szechuan-Kansu range. Local endemism is high for the genus. Of the endemic species, Yunnan, with its 15 species, has the highest number, Szechuan has 13, Taiwan 10, Tibet 9, Kansu 6, Sikang 5. It is interesting to note that the species in Sinkiang are all widespread, while nearly half of the 21 species in its neighboring province, Tibet, are local endemics (MAP 3).

Erigeron is a widespread genus with species occurring in America, Australia, Asia and Europe. In China there are twenty-five which are fairly evenly distributed throughout the country. They are absent from Ninghsia, Kansu, Chinghai and Tibet (MAP 4). There are several weedy species which occur in extensive areas. For example, *E. acer* occurs in ten provinces from Hupei and Szechuan due north to Kirin and westward to Sinkiang. *E. canadensis* has an even wider range, occurring in fourteen provinces from Taiwan-Kwangtung northward to Kirin and thence due west to Sinkiang. This genus has very few endemic species. Half of the eight endemics are in the Altai region.

Blumea is a genus with an African-Asiatic-Australian range. In China there are thirty species which concentrate in Taiwan, Kwangtung, Hainan,



MAPS 1-8. The geographical ranges in China of eight large genera of Compositae in the tribes Vernonieae, Eupatorieae, Astereae, and Inuleae.

Yunnan and Kweichow (MAP 5). Most of the species have an Indo-Malaysian distribution. In China they occur largely in the few border provinces where there are port cities. The large number of endemics in Kweichow (50%) is evidently due to the careless work of L evell e and Vaniot who published too many species from fragmentary collections. *Blumea* serves as a good example of the route of migration and the area of extension of tropical elements in the flora of China.

Leontopodium is a discontinuous genus occurring in the high mountains or high latitudes of Europe, Asia and South America. In China there are 57 species which are concentrated in Yunnan, Szechuan, Sikang and Tibet, and thence northeastward through Kansu, Shansi, Chahar to Heilungkiang and Mongolia. In the mountains of the Meridional Ranges there are many endemics and hybrids (MAP 6). It is very likely that this region is both the center of concentration and the place of origin of the genus. For example, *L. kamtschaticum*, as is indicated by many recent collections, is concentrated in Sikang; thence it extends westward to Tibet, and northeastward to Szechuan, Kansu, Chahar, Mongolia, Heilungkiang, Far Eastern Russia and Kamchatka. It is evident that although the species was first described from Kamchatka, this peninsula is only on the periphery of its range. *Leontopodium japonicum* tells almost the same story. It is very likely that the species originated in the west, somewhere in the mountains on the Kansu-Shensi-Szechuan border, thence it extended eastward through Hupei and Anhwei to Japan or through Hopei and Korea to Japan. These are common routes for the migration of many Sino-Japanese species.

Anaphalis is another genus which has a discontinuous range and which has its concentration of species in the Meridional Ranges of China. It has been recorded from Europe, Asia and North America, but the bulk of the species are in China. There are 51 species, many of them local endemics, concentrated in Yunnan, Szechuan, Sikang and Kansu (MAP 7).

Gnaphalium is a genus of the warm regions throughout the world. In China there are twenty species, rather evenly distributed from Hainan to Heilungkiang. Although there are a few endemics in Yunnan, Sikang and Tibet, there is no region which can be considered as the center of concentration of species for this genus. There are a few widely spread species. For example, *G. affine* extends from Taiwan to Nepal, occurring in fifteen provinces in China. It is a very tough species and colonizes all sorts of waste places, even the perpendicular cracks of dry hard city walls. *G. hypoleucum* is another widespread species which extends from Taiwan to Nepal. It occurs in eight provinces. It is interesting to note that in China the species occurs only in areas where there are large centers of commercial or political activity (MAP 8).

Inula is an Old World genus with species occurring in Africa, Europe and Asia. In China there are twenty-eight species which are evenly dis-

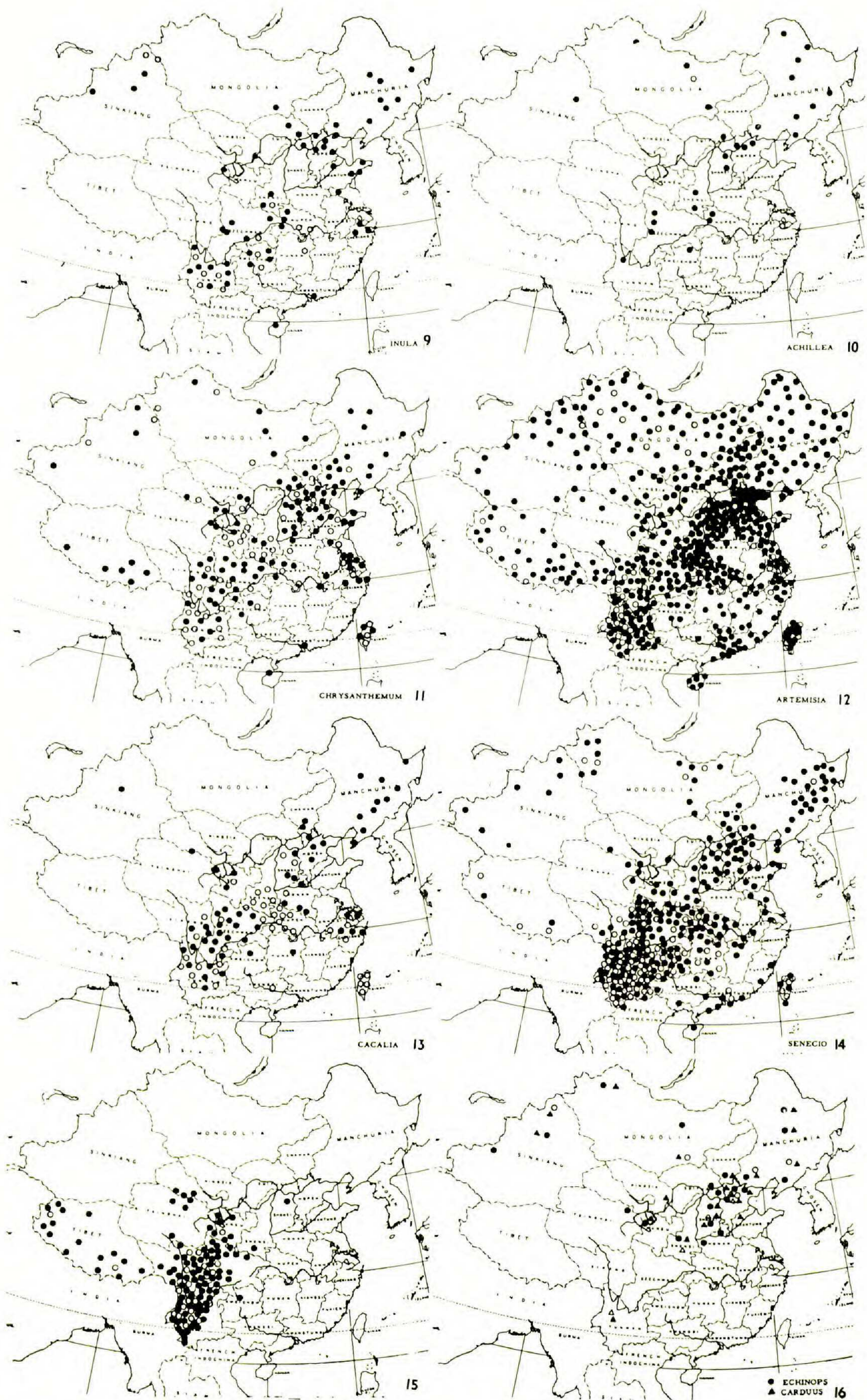
tributed in the temperate and the mid-high altitudes of the subtropical regions (MAP 9). It seems that Yunnan, Szechuan and Kweichow constitute the center of the species concentration. In Yunnan and Kweichow almost half of the species are endemics. There are a few widespread species. For example, *I. britannica* and its varieties occur in fifteen provinces north of the Yangtze River and *I. cappa* occurs in six provinces south of the same river. Several species of this genus are very good indicators of the types of vegetation in China. In addition to *I. britannica* and *I. cappa*, which have a northern or a southern distribution, *I. salsoloides* expresses a special floristic relationship between Hopei, Chahar, Suiyuan, Ninghsia, Shansi, Shensi, Kansu, Chinghai and Sinkiang, and *I. serrata* illustrates the floristic affinity between Sikang, Yunnan and Kweichow.

Carpesium is a genus of the north temperate or subtropical regions of the Old World. Its range extends from Europe through Asia to Japan. It has eighteen species in China. It seems to have two centers of concentration, the one being Yunnan, Szechuan, Sikang, Hupei, Shensi, Shansi and Hopei and the other being Taiwan and Kwangtung. There are several widespread species. *Carpesium abrotanoides* occurs in twelve provinces, from Taiwan-Kwangtung westward to Yunnan and Sikang and thence due north to Shensi and Hopei. *Carpesium cernuum* shares the same range, but extends even more northward to Kirin. There are relatively fewer local endemic species in this genus.

Achillea is a widely distributed genus of the northern hemisphere. There are 10 species in China. With the exception of a southern variety of *A. sibirica*, which occurs in Kweichow and Yunnan, and an Eurasian-American species, which was recorded from Chekiang, the genus is restricted to the north of the Yangtze River (MAP 10). Its distribution is a good illustration of the southern limit of the northern elements in the flora of China.

Chrysanthemum is a large genus with species occurring in Europe, Canary Islands, Africa, temperate Asia and America. In China there are seventy-three species, many of which are local endemics known only from the type collection. Most of the endemic species are in Sikang, Yunnan, Szechuan, Kansu, Shensi, Shansi, Mongolia and Sinkiang (MAP 11). The taxonomy of this group is in bad shape, and it is highly possible that many of the endemics described as species in this genus are merely local variants of a few species. It is interesting to note that the genus is poorly represented in low altitudes of South China. *Chrysanthemum indicum* is a widespread species recorded from thirteen provinces.

Artemisia is a cosmopolitan group which in China is the second largest genus of Compositae. Its 156 species represent every province of the country. As far as the number of species in each province is concerned, Hopei takes the lead with 59 species, 3 of which are local endemics. Yun-



MAPS 9-16. The geographical ranges in China of eight large genera of Compositae in the tribes Inuleae, Anthemideae, Senecioneae, and Cynareae.

nan has 50 species, 11 of which occur in that province alone. Szechuan has 41 species, 5 of which are local endemics. Taiwan has 25 species, 7 of which are endemics. Considering the small size of the island, the genus is very well represented there. In fact, *Artemisia* is the only genus of Compositae that has been recorded from every province (MAP 12). This genus needs revision; many local variants, apomictic or polyploid forms have been named as species and, consequently, many taxa show anomalous patterns of distribution. For example, *A. dubia* var. *septentrionalis* has been recorded from Hainan, Kweichow and Hopei, and *A. handel-mazzettii* has been recorded from Yunnan and Hopei only. Such disjunction is not known in any other species of flowering plants in China.

Gynura has an African-Asiatic-Australian distribution. There are 16 species in China. With the exception of *G. ovalis* var. *pinnatifida*, which extends into the southern part of Shensi, all the rest are distributed to the south of the 30°N. parallel. Thus the species of *Gynura* serve as good examples for showing the northern limit of the range of southern elements in the flora of China.

Cacalia is an Asiatic-American genus. Its species occur in Asia, North America, Central America and the West Indies. In China there are 60 species which are distributed in high altitudes and mid-latitudes. Yunnan, Szechuan, Sikang, Kansu, Shensi, Shansi, Hupei, Hopei and Honan seem to be the center for the concentration of the species. It has a high percentage of endemism (MAP 13). Forty per cent of the species in Yunnan are known only from the type material. All the species in Taiwan are endemics. *Cacalia* is morphologically closely related to *Senecio* and *Ligularia*. The distributional patterns of these three genera are also similar. It is worthy of note that this is the only genus that has 5 species in Honan, a province in which other genera of Compositae are relatively poorly represented.

Senecio is the largest genus of Compositae, and a very heterogenous one. Its species occur in all parts of the world. In China, because of the recognition of *Cacalia*, *Ligularia* and *Cremanthodium*, all of which are included in this genus by some authors, *Senecio* becomes the second largest genus. However, if Franchet or James Small's interpretation of the genus were adopted, *Senecio* would be the largest genus in China. The concentration of species of this genus is in Yunnan, Szechuan, Sikang, Kweichow and Hupei (MAP 14). In Yunnan alone there are 73 species, 41 of which are known only from that province. Szechuan has 51 species, 12 of which are local endemics. Sikang has 13 species, 6 of which are local endemics. Kweichow has 23 species, 7 of which are not known elsewhere.

Ligularia is a genus with European-Asiatic distribution. In China there are 105 species highly concentrated in Yunnan, Szechuan, Kansu and Hopei. In Yunnan alone there are 50 species, 27 of which are known

only in that province. Szechuan has 49 species, 14 of which are local endemics.

Cremanthodium is an endemic genus of the Meridional Ranges. Its distribution extends to the Himalayan Region. In China there are 47 species concentrated in Yunnan, Sikang, Szechuan, Tibet and Kansu (MAP 15). There are 38 species in Yunnan, about one-fourth of which are endemic to that province. Within China this genus is strictly limited to the Southwest. Its closely related genera *Cacalia*, *Senecio* and *Ligularia* are all well represented in Taiwan, but the range of *Cremanthodium* extends hardly beyond the Long. 110° E.

Echinops is an Old World genus with species occurring in southern Europe, the Mediterranean region, tropical Africa and eastern Asia. There are 11 species in China distributed north of the 35° N. parallel (MAP 16). Judging from the specimens in the Gray Herbarium, the center of concentration of the species appears to be western and central Asia. China is only on the periphery of its range. Several species have a considerably wider range. For example, *E. latifolius* extends from Dahuria to Honan, and *E. gmelinii* covers almost the same area. There are four endemic species known only from their type collections.

Carduus is another European-African-Asiatic genus. There are eleven species in China, two of them with wide ranges. *Carduus acanthoides* occurs in six provinces from Yunnan-Kweichow northward to Kansu and Hopei. *Carduus crispus* has an even wider range, occurring in 16 provinces from Chekiang westward to Szechuan and northward to Heilungkiang and Mongolia. The other species are local endemics (MAP 16).

Cirsium is a widespread genus with species occurring in North Africa, Asia and North and Central America. There are 59 species in China. They are distributed throughout the country. Yunnan, Szechuan, Kweichow and Taiwan are areas of high endemism. Yunnan has 22 species, 13 of which are confined to that province. Taiwan has 12 species, 7 of which are endemics. There are several widespread species. For example, *C. arvense* (first recorded from the Canary Islands), and its various varieties occur in 11 provinces, from Kiangsu to Heilungkiang and thence due west to Sinkiang. *Cirsium chinense* is another widespread species. Its range extends from Taiwan to Yunnan and northward to Shensi and Hopei. In most places it is a very troublesome weed.

Saussurea is a genus widely distributed throughout the northern hemisphere and the mountains of Australia. In China it constitutes the largest genus of the Compositae. There are 279 species, especially well represented in Yunnan, Szechuan, Sikang, Tibet, Hupei, Kansu, Shensi, Shansi, Hopei, Jehol, Kirin, Mongolia and Sinkiang (MAP 17). Yunnan alone has 94 species, 53 (almost 57%) of which are confined to that province.

There are 82 species in Szechuan. Twenty-six (almost 32 per cent) of them are local endemics. Twenty-two (a little over 43 per cent) of the 51 species from Sikang are endemic to that province. It is interesting to note that the genus is poorly represented in eastern and southern China, and it has never been recorded from Kwangsi, Hainan and Honan. It is evident that the species of this genus prefer high altitudes or high latitudes.

Jurinea is an Old World genus with species occurring in central and southern Europe, North Africa, western and central Asia. In China there are 18 species, all of which are local endemics (MAP 18). They are known only from a few western provinces, and often only through the type collection.

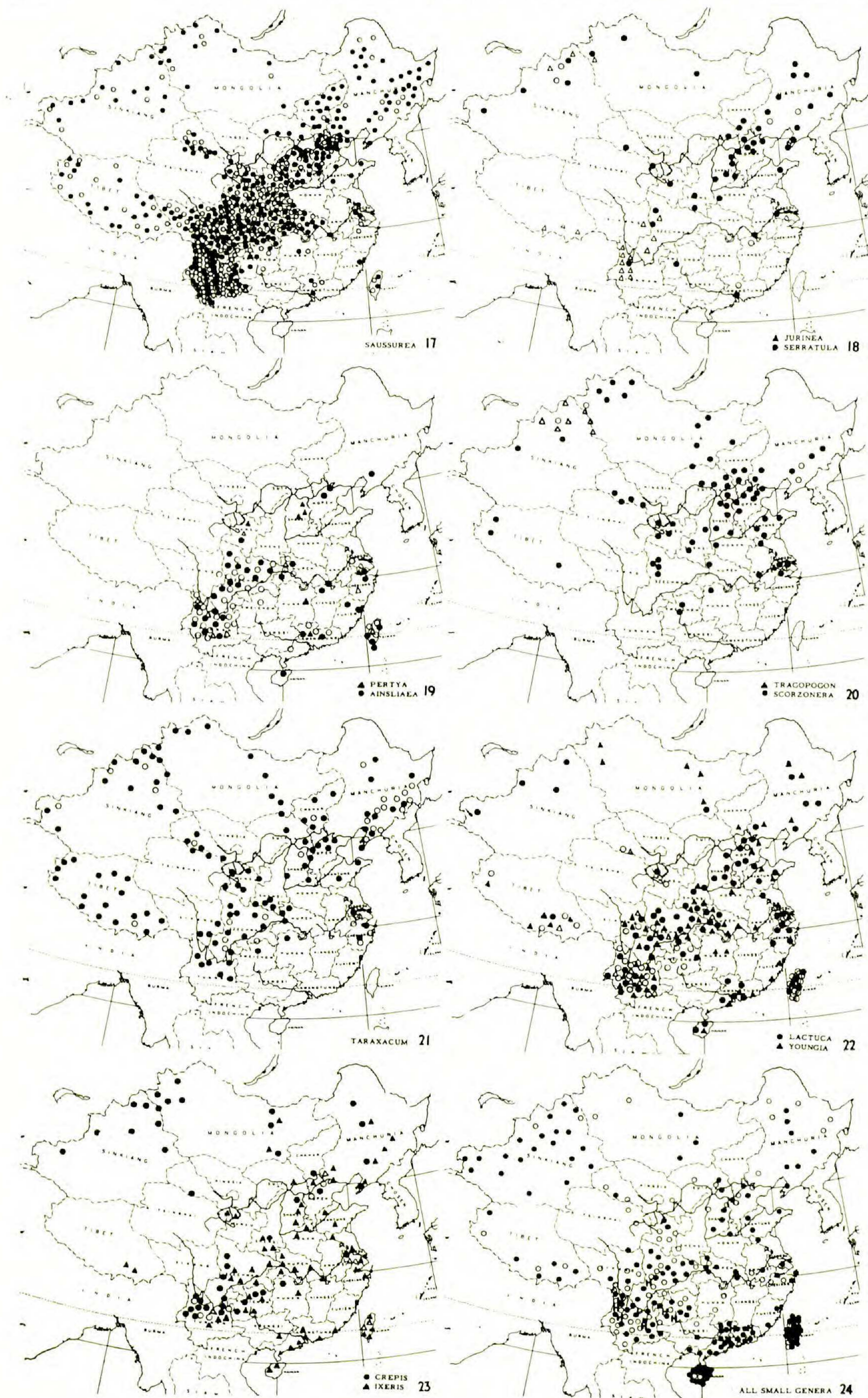
Serratula is another Old World genus occurring in Europe and North Africa, thence due east to Japan. In China there are nineteen species distributed chiefly north of the Yangtze River. Some species also occur in Kirin, Heilungkiang, Mongolia and Sinkiang (MAP 18).

Pertya is an Asiatic genus occurring from Afghanistan to Japan. There are ten species in China, all with very limited range (MAP 19). Almost half of them are known only through the type material.

Ainsliaea is another Asiatic genus. Yunnan, Szechuan and Hupei constitute its center of distribution, and northern India and Japan are on the periphery of its range. There are 47 species in China (MAP 19). Many of them are local endemics. For example, there are 22 species in Yunnan, 14 of which are endemic to that province. There are several species which indicate the relationship between the flora of Taiwan and the mainland of China. For example *A. fragrans* occurs in Taiwan, Kwangtung, Chekiang, Kiangsu, Kiangsi and Hopei. *Ainsliaea macroclinidioides* has the same range. In both cases the type localities are on the periphery of the range of the species. *Ainsliaea reflexa* and its varieties occur in Taiwan and also in Yunnan. This distributional pattern is common with many genera of woody plants.

Gerbera is a southern genus with species occurring in South Africa, Madagascar, tropical Asia and Tasmania. There are 10 species in China, and Yunnan and Szechuan again constitute the center of the species concentration. *Gerbera anandria* is a widespread species. It occurs in 15 provinces from Kwangtung northward to Kirin and Mongolia. A little over 45 per cent of the eleven species and varieties in Yunnan are endemic.

Tragopogon is an Old World genus with species occurring in Europe, the Mediterranean region, and western and central Asia. There are 10 species recorded from China. With the exception of three European species (one recorded from Nanking as a cultigen, and two from gardens in Peking) all the rest are localized in Sinkiang, especially the Tien-shan-Altai region



MAPS 17-23. The geographical ranges of seven large genera of Compositae in the tribes Cynareae, Mutisieae and Cichorieae. MAP 24. The distributions of small genera of Compositae in China. Dots = endemics, circles = adventives, and H = Himalayan genera.

(MAP 20). *Tragopogon* is a good example of the extent of Central Asiatic elements in the flora of China.

Scorzonera is another Old World genus with species occurring in Europe, the Mediterranean region, western and central Asia, and thence due east to China, Korea and Japan. In China, there are eighteen species distributed in the arid regions of mid-high latitudes and the arid regions of Szechuan and Tibet (MAP 20). The percentage of local endemics is low. Several species have wide ranges. For example, *S. albicaulis* occurs in twelve provinces from Chekiang westward through Hunan and Kweichow to Szechuan and thence due north through Honan, Shantung, Shensi and Hopei to Chahar, Liaoning and Kirin. *Scorzonera austriaca* occurs in eight provinces extending from Kiangsu northward through Honan, Shantung to Kansu and Mongolia. It is worthy of notice that in the distribution of *Senecio*, *Ligularia*, *Saussurea* and many other genera of Compositae, Yunnan and Szechuan are twin provinces in respect to high numbers of species, but this is not so with *Scorzonera*. Four species of *Scorzonera* have been recorded from Szechuan and none from Yunnan.

Taraxacum is a cosmopolitan genus of weedy species. The taxonomy of this genus is very difficult. When Handel-Mazzetti published his monograph of *Taraxacum* in 1907, he included 57 species. Index Kewensis lists in all over 1200 species, but binomials have been assigned to many apomictic forms. It is very hard to decide what is the approximate number of species of this genus in China. When Dahlstedt published H. Smith's collection in 1926 he added one-fourth more binomials to the Chinese *Taraxacum*. With the species added by Kitagawa in 1933-38, and Koroleva in 1940, 57 have been recognized from China. It seems that a large number of species are found in Yunnan, Szechuan, Tibet, Kansu, Sinkiang, Mongolia, Chahar, Liaoning and Kirin (MAP 21). It is interesting to note that this genus is poorly represented in the warmer regions of China. It has not been recorded from Fukien, Kwangtung, Kwangsi or Hainan.

Sonchus is another cosmopolitan and weedy genus. There are 10 species in China, several of them widespread. *Sonchus arvensis* and its varieties occur in twenty provinces, from Taiwan and Kwangtung northward to Sinkiang, Mongolia and Kirin and *S. oleraceus* occurs in fourteen provinces, from Hainan northward to Kirin and westward to Sinkiang. Four local endemics have been recorded from Yunnan, Szechuan, Kweichow and Tibet. There seems to be no center of species concentration in China.

Lactuca is a cosmopolitan genus. There are 57 species in China distributed from Kwangtung and Hainan northward to Kirin and Heilungkiang. It seems that Yunnan, Szechuan and Kweichow form a center of concentration of species on the mainland, and Taiwan furnishes an area of diversification off the coast. A high percentage of endemism occurs

among species in both regions. In Yunnan there are 27 species, 17 (about 63 per cent) of which are endemics. In Taiwan there are 14 species, 11 (79 per cent) of which are endemics. There are a few widespread species: *L. indicus* and its varieties occur in 15 provinces, from Kwangtung northward to Kirin and *L. tatarica* occurs in 8 provinces, from Honan to Mongolia and westward to Sinkiang (MAP 22).

Prenanthes is a widespread genus with species occurring in South Africa, the Canary Islands, the Mediterranean Region, Europe, Asia, and America. The strongest development of this genus is in central and northern Europe. There are nineteen species in China. Yunnan, Szechuan and Kweichow again form the center of concentration of species. High ratios of endemism occur in Szechuan and Kweichow, where over 60 per cent of the species are known only from the type localities. There are a few widespread species. *Prenanthes brunoniana* and its varieties occur from northern India eastward through Yunnan, Kweichow to Hupei and Hainan. *Prenanthes tatarinowii* and its varieties occur in eight provinces from Hupei northward to Chahar and Kirin.

Crepis is a widespread genus with species occurring in the Canary and Madeira Islands, Europe, Africa, Asia, and North America. In China there are 31 species, concentrated in Yunnan, Szechuan, Kweichow, Sikang, Tibet, Sinkiang, and Mongolia (MAP 22). Yunnan seems to be the area of the highest species-diversification. It has not only the largest number of species but also the highest ratio of endemism (about 30 per cent). Most species have small ranges, usually limited to two or three provinces. For example, *C. rigescens* is limited to Yunnan and Szechuan, *C. tibetica* to Yunnan, Sikang and Tibet, *C. bodinieri* is confined to northern Yunnan and the adjacent area of Szechuan, and *C. chrysantha* to the Altai Region. As suggested by Babcock, *Crepis* is originally an Asiatic genus and the Altai region (northwestern Sinkiang and southwestern Mongolia) seems to be its center of origin. This region is still a part of the center of the concentration of species for the genus today. It is also worthy of note that *Crepis* is not represented in Taiwan, Fukien, Kwangtung, Hainan, Chekiang, Anhwei, Kiangsi, Shantung, Honan or Kirin.

Youngia is an Asiatic genus with species occurring from the Himalayan Region eastward to Japan. In China there are thirty species distributed from Hainan, Kwangtung and Taiwan, thence northward to Heilungkiang (MAP 22). Like *Crepis*, it has its center of species concentration in Yunnan and Szechuan, but it differs from *Crepis* in that it occurs also in the tropical regions. Again it differs from *Crepis* in that it has many widespread species. For example, *Y. japonica* and its varieties occur in thirteen provinces from Hainan, Kwangtung and Taiwan northward to Shantung, Hopei and Shensi. *Youngia sonchifolia* occurs in thirteen provinces from Chekiang to Szechuan and thence due north to Kirin and Heilungkiang.

Ixeris is another Asiatic genus with species distributed from the eastern Himalayan Region to Japan. In China there are fourteen species ranging from Hainan and Kwangtung northward to Heilungkiang (MAP 23). Most of them are widespread weeds. For example, *I. chinensis* occurs in twenty-one provinces. Actually it is very difficult to determine the approximate number of species of *Ixeris* in China, since contemporary authors do not agree on the status of some of the taxa. The criteria for distinguishing *Ixeris*, *Youngia*, *Crepis* and *Lactuca* are not sufficiently strong and many species have been changed back and forth among these genera. For example, *I. chinensis* has been named *Prenanthes chinensis*, *Youngia chinensis* and *Lactuca chinensis*. Likewise, *Ixeris chinensis* ssp. *graminifolia* has been named *Ixeris graminifolia*, *Crepis graminifolia* and *Lactuca chinensis* f. *graminea* by outstanding synantherologists of our time.

Hieracium is a widespread genus with species in Europe, North and South America, North and South Africa, and northern and eastern Asia. There are fourteen species in China, distributed from Kiangsu, Kiangsi, Kweichow and Szechuan northward to Kirin, Heilungkiang and Sinkiang. Most of them have small ranges. *Hieracium umbellatum* is the only widespread species. It occurs in twelve provinces from Kiangsi-Hupei-Szechuan northward to Kirin, Heilungkiang, Mongolia and Sinkiang. According to Stebbins most of the Asiatic species are apomictic (Babcock, 1947, p. 83).

In conclusion, we may point out that the larger genera of Chinese Compositae evidently have four types of distribution. The first type, which is the most frequent, includes widespread genera with definite centers of species concentration. Twenty-two of the thirty-eight large genera (almost 57 per cent) have this type of distribution. *Aster*(T), *Leontopodium*, *Anaphalis*, *Artemisia*(T), *Inula*, *Chrysanthemum*(T), *Cacalia*(T), *Senecio*(T), *Ligularia*(T), *Cremanthodium*, *Cirsium*(T), *Saussurea*(T), *Jurinea*, *Gerbera*, *Ainsliaea*(T), *Prenanthes*, *Taraxacum*, *Lactuca*(T), *Crepis*, *Youngia*, *Pertya* and *Ixeris*(T) all belong here. The center of species concentration of all these genera is the Meridional Ranges. The genera marked (T) also have secondary centers of concentration in Taiwan. The second type comprises the northern genera with ranges limited to the north of the Yangtze River. Seven of the thirty-eight large genera (about 20 per cent) have this type of distribution. *Achillea*, *Echinops*, *Tragopogon*, *Scorzonera*, *Carduus*, and possibly *Hieracium* and *Serratula* belong here. Most of these genera also occur in Europe, the Mediterranean Region and central or western Asia. The third type includes the southern genera, the ranges of which are limited to the south of the Yangtze River. Of the thirty-eight large genera only *Vernonia*, *Eupatorium*, *Blumea*, and *Gynura* have this type of distribution. The fourth type includes those widespread genera which have no definite centers of species concentration. *Erigeron*, *Gnaphalium*, *Carpesium* and *Sonchus* exemplify this type of distribution and all include some widespread weedy species.

2. THE SMALL GENERA AND THEIR DISTRIBUTIONS

The small genera are taxa comprising one to nine species. This arbitrary classification is made merely for the convenience of discussion. There are 128 such small genera of Compositae in China. Their distribution among the tribes is given in TABLES I and II. Most of these genera include one to three species, but a few have four or more species. The sizes of these small genera as indicated by the number of the included species are shown in the following graph (FIG. 2).

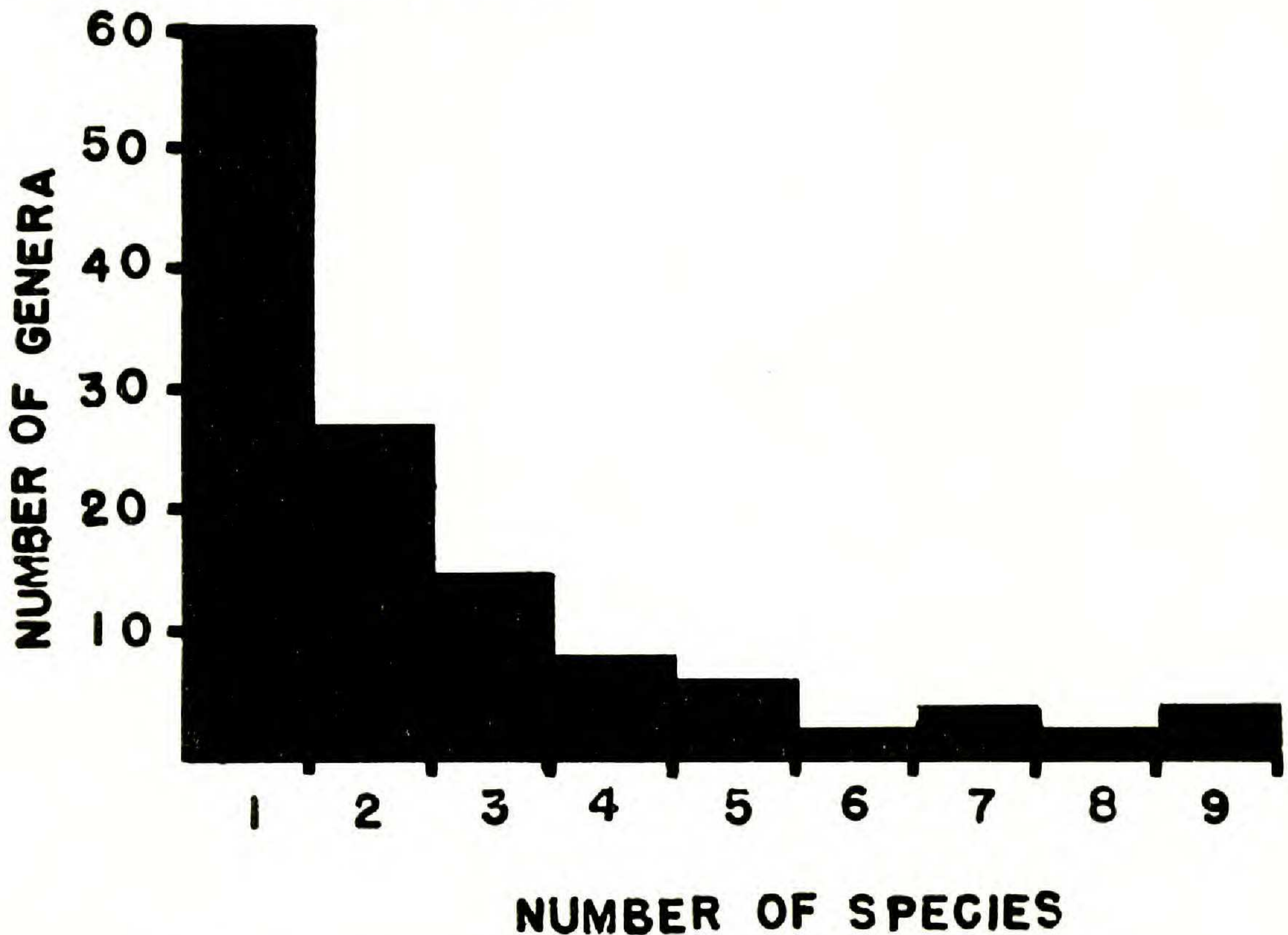


FIG. 2. The size and number of small genera of Compositae in China.

MAP 24 illustrates the general pattern of distribution and the areas of concentration of the small genera of Compositae in China. An analysis of the distributional record of these genera reveals that they may be grouped into three types. These are the genera with species in China known only in cultivation, the genera containing only isolated endemics, and the genera with native species in China and also elsewhere in other floristic regions.

Endemics. Thirty-four of the 128 small genera are endemic to China. Their occurrence in various provinces is as follows: Yunnan 15, Szechuan 8, Kansu 6, Sikang and Hopei each 4, Heilungkiang, Kirin, Kweichow, Taiwan and Tibet each 3, Chekiang, Chinghai, Kwangtung, Mongolia, Shansi and Suiyuan each 2, and Hupei, Kiangsi, Ninghsia, Kwangsi and Shensi each 1.

A few of these endemic genera were first described from the Himalayan

Region. Recent collections extend their range to Yunnan, Szechuan, Kweichow, Kwangtung and Taiwan. It is evident that the high mountains bordering Yunnan, Szechuan, Sikang and Kansu (the Meridional Ranges) constitute a center of aggregation for the small genera.

Genera known in China only as cultivated plants. Twenty-one of the 128 small genera of Compositae are known in China only in cultivation. The commonest species belong to the genera *Zinnia*, *Helianthus*, *Coreopsis*, *Cosmos*, *Ageratum*, *Gaillardia* and *Calendula*. In the warmer part of the country, the escaped *Ageratum conyzoides* is naturalized and appears weedy in gardens, fields or along the roadside.

Genera with native species in China as well as in other floristic regions. Seventy-three of the 128 small genera of the Chinese Compositae occur also in central Asia, tropical Asia, Africa, the Pacific Islands, Australia or America. There is no record of their introduction from these regions to China or vice-versa. They were probably dispersed accidentally through man's activities. Five of them have widespread species which are usually considered as weeds. *Eclipta* has only one species in China, and this species has been recorded from thirteen provinces. It is a common weed in cotton or soybean fields and its occurrence in China can be traced back to the ancient historical period. Likewise, *Xanthium*, as represented by *X. strumarium*, occurs in seventeen provinces in China. *Bidens parviflora* occurs in thirteen provinces and *B. biternata* in ten provinces.

However, the majority of these small genera have limited distributions. MAP 24 indicates that they concentrate in Taiwan, Kwangtung, Hainan, Chekiang, Hupei, Szechuan, Yunnan, Hopei, Shansi, Sinkiang and, to a lesser extent, in Mongolia, Liaoning and Heilungkiang. A comparison of their distributions outside China and their concentration within the country presents evidence of a correlation between the occurrence of these small genera of Compositae and the courses of the ancient trade routes or the ports of the newer waterways. These correlations are shown by the following statistics:

(1) Within China the distributions of small genera with tropical Asian and African range are like this: Hainan 5, Kwangtung 4, Taiwan 4, Szechuan 3, Yunnan 2, Kweichow 2 and Fukien 1.

(2) Within China the distributions of small genera with pantropical or tropical American range are like this: Taiwan 18, Kwangtung 16, Hainan 14, Szechuan 10, Yunnan 9, Chekiang 3, Fukien 3, Hupei 2, Kiangsu, Kweichow, Hunan and Kwangsi 1 each.

(3) Within China the distributions of small genera with tropical Asian, Pacific Islands and Australian Range are like this: Taiwan 3, Hainan 3, Kwangtung 2, Yunnan, Szechuan and Hupei 1 each.

(4) Within China the distributions of small genera with Central Asian-Mediterranean-European-American Range are like this: Sinkiang 20, Tibet 6, Mongolia 5, Kansu, Shantung, Hopei, Szechuan, and Liaoning each 3, Kiangsu, Kweichow and Heilungkiang each 2, Honan and Anhwei 1 each.

It is interesting to point out that the largest number of the tropical Asiatic or African genera occur chiefly in Hainan, Kwangtung and Taiwan. Their absence from the coastal towns in Chekiang and Kiangsu or the metropolises along the Yangtze River, and their occurrence in Yunnan, Kweichow and Szechuan, indicate that these genera were probably introduced through the ancient trade routes connecting Rangoon (Burma) and Yunnan (MAP 31), or those connecting Hanoi (Indo-China) and Yunnan, thence due north through Kweichow and Szechuan to the ancient Chinese capital, Sian, in Shensi.

The pantropical genera are also concentrated in Taiwan, Kwangtung, Hainan, and, to a lesser degree, in Yunnan and Szechuan. Some of them also occur in Chekiang, Hupei and Kiangsu. It is evident that these genera were introduced to the interior provinces of Yunnan, Szechuan, Kweichow, etc., through the Yangtze waterway as well as through the Burma and Indo-China trade routes.

The most striking facts are centered about the genera with central Asiatic, Mediterranean and European distribution. Of these genera Sinkiang has the largest number, followed by Tibet and Mongolia. Liaoning and Heilungkiang also have some species. It is evident that the distributions of these genera follow the ancient trade routes. The most-used trade routes of ancient China passed through Sinkiang Province, and it is here that the largest number of genera common to China and Central Asia, the Mediterranean Region, and Europe are found.

Tibet is on the main ancient trade route that connected the upper Gangetic Plain, Central Asia and west China. Heilungkiang is on the eastern end of the great Northern Trade Route which connects Manchuria, Siberia, Central Asia and Europe. The occurrence of genera of Compositae which are predominantly central Asiatic, Mediterranean or European indicates that these small genera are adventives to the flora of China.

Regarding the small genera of Compositae in China we may observe that (1) most of the small genera are really small, about 70 per cent of them including only one or two species; (2) slightly over one-fourth of the small genera are endemics, many of them being aggregated in the Meridional Ranges; (3) about half of the small genera are probably adventives introduced to China either through the ancient trade routes or through the more recent waterways.

(To be concluded)